

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 11, 12, 14, 17, 18, and 25-31 are currently pending. Claim 29 has been amended by the present amendment. The change to the claim is supported by the originally filed specification and does not add new matter.

In the outstanding Office Action, Claims 11, 14, 17, 18, and 25-31 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,751,196 to Hulyalkar et al. (hereinafter “the ‘196 patent”) in view of U.S. Patent Application Publication No. 2004/0029553 to Cain (hereinafter “the ‘553 application”); and Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘196 patent and the ‘553 application, further in view of U.S. Patent No. 6,904,290 to Palenius (hereinafter “the ‘290 patent”).

Claim 30 is directed to a **radio station**, comprising: (1) a control signal reception unit configured to receive a control signal for communication connection with a **radio control station** from the radio control station; (2) a reception level measuring unit configured to measure a reception level of the control signal at the radio station; (3) a relay controlling unit configured to receive a relay control signal to which a reception level of the control signal at an other radio station is added; and (4) an information signal transmission/reception unit configured to relay an information signal, which is different from the control signal, to an other radio station according to a route in which the relay control signal is relayed, wherein when the reception level added to the relay control signal is smaller than the reception level at the radio station, the relay controlling unit adds the reception level at the radio station to the received relay control signal, and relays the relay control signal, to which the reception level at the radio station is added, to other neighboring radio stations; when the radio station is a source of the information signal, the information signal transmission/reception unit transmits

the information signal according to a route notified by a response relay control signal which is transmitted by **a direct radio station** capable of transmitting the information signal to the radio control station directly; and the response relay control signal is transmitted by the direct radio station in response to receiving the relay control signal at the direct radio station.

Regarding the rejection of Claim 30 under 35 U.S.C. § 103(a), the Office Action asserts that the '196 patent discloses everything in Claim 30 with the exception of "a transmission radio station, which is 'a source of the information signal, transmits the information signal' according to the route notified by the response relay control signal,"<sup>1</sup> and relies on the '553 application to remedy those deficiencies.

The '196 patent is directed to a wireless communication system including a plurality of wireless communication stations associated with the network, wherein one of the wireless stations is designated as a central control station and each wireless station comprises a transmitter and a receiver. As shown in Figure 2A, the '196 patent discloses a peer-to-peer network in which the station designated as the centralized controller communicates with every other terminal over a wireless control plane, while each station communicates with each other station over a wireless user plane. Further, the '196 patent discloses that a quality assessment is made regarding communication between two stations, which may be made on either the wireless control plane or the wireless user plane, and that various quality assessments can be used.<sup>2</sup> In particular, the '196 patent discloses that a signal-to-noise ratio or a signal strength measurement may be used as the quality assessment. The '196 patent also discloses that an estimate of the likelihood of an erroneous bit value being received can also be used as a quality assessment. Further, the '196 patent discloses that each station will maintain a local database of the quality assessments for communication with other stations,

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<sup>1</sup> See page 5 of the outstanding Office Action.

<sup>2</sup> See '196 patent, column 4, lines 20-40.

and that the central controller will maintain a global database of quality assessments. See Figure 5, which is an example of the quality matrix between various nodes in the network.

The '196 patent also discloses that relay paths may be instituted between stations based on the measured quality levels and various other factors, and that various algorithms are used to decide whether a relay path should be established, and which relay path should be established.<sup>3</sup>

However, Applicants respectfully submit that the '196 patent fails to disclose a relay controlling unit configured to receive a relay control signal to which a reception level of the control signal at an other radio station is added, as recited in Claim 30. While the '196 patent discloses that local quality assessments at a radio station are transmitted to the centralized controller, Applicants note that Claim 30 is directed to a radio station, but also recites a control signal from a radio control station, and also recites a direct radio station capable of transmitting the information signal to the radio control station directly. Thus, the '196 patent does not disclose that a radio station, which is not the radio control station, nor the direct radio station capable of transmitting the information directly to the radio control station directly, receives a relay control signal to which a reception level of the control signal at another radio station is added, as required by Claim 30. Rather, the '196 patent merely discloses that the centralized controller receives the quality assessments from the other radio stations.

Further, Applicants respectfully submit that the '196 patent fails to disclose that when the reception level added to the relay control signal (which is received by the radio station) is smaller than the reception level at the radio station, the relay controlling unit adds the reception level at the radio station to the received relay control signal, and relays the relay control signal, to which the reception level at the radio station is added, to other neighboring

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<sup>3</sup> See '196 patent, column 7, line 22 through column 8, line 19.

radio stations, as recited in Claim 30. Applicants note that the claimed relay controlling unit includes functionality that is conditional, i.e., the reception level at the radio station is added to the received relay control signal, **when** the reception level added to the relay control signal is smaller than the reception level at the radio station. Applicants respectfully submit that the '196 patent fails to teach or suggest this limitation.

In this regard, Applicants note that the Office Action on page 4 refers to passages in columns 2, 4, 5, 6, and 7 in the '196 patent as disclosing this limitation. The passage in column 2 merely discloses that individual quality assessments are forwarded to the centralized controller and form a global matrix of quality assessments, which is used to determine which radio station should be the centralized controller. Further, the passage at column 4 is merely directed to how the quality assessment at each station is determined, and states that quality assessment can be made in both the control and user planes and can be, for example, a signal to noise ratio. Further, the passage in columns 5 and 6 relate to how the centralized controller is selected. In addition, the passage cited in column 7 relates to determining relay transmission paths, if a path has poor quality and efficiency is lost since transmissions across the path may require repetition until they are accurately received. None of the cited passages in the '196 patent disclose a radio station adding reception level at the radio station to a received relay control signal (to which a reception level of the control signal at another radio station is added) and relaying that relay control signal to other neighboring radio stations, **when** the reception level added to the radio control is smaller than the reception level at the radio station, as recited in Claim 30. As discussed above, the '196 patent does not disclose the conditional nature of this functionality, and does not disclose that when the relay control signal is smaller than the reception level at the radio station, it is used as a criteria for performing any action.

Further, Applicants respectfully submit that the '196 patent fails to disclose that when the radio station is a source of an information signal, that the radio station transmits the signal according to a route notified by a response relay control signal which is transmitted by a direct radio station, wherein the direct radio station transmits the response relay control signal in response to receiving a relayed control signal at the direct radio station, as recited in Claim 30. Rather, the '196 patent merely discloses that routes can be determined based upon the quality assessments maintained in the local database and in the global database maintained by the centralized controller, but does not disclose that a direct radio station, which is different from the radio control station, as well as the claimed radio station, receives a relay control signal, and then sends a route to the radio station, which then sends the information signal, as recited in Claim 30.

Moreover, the '196 patent describes that each of the wireless terminals transmit quality assessments to the centralized controller. More particularly, the '196 appears to describe that each wireless terminal directly transmits the quality assessments to the centralized controller. Thus, the '196 patent fails to teach or suggest receiving the quality assessments at another terminal (e.g., not the centralized controller).

Further, even assuming that each mobile terminal transmits the quality assessments to the centralized controller via other wireless terminals, the '196 patent fails to disclose comparing, at the one radio station, the reception level added to the relay control signal with the reception level of the one radio station, and adding the reception level at the one radio station to the received relay control signal, and relaying the relay control signal, to which the reception level at the one radio station is added, to other neighboring radio stations, when the reception level added to the relay control signal is smaller than the reception level of the one radio station, as claimed.



The '553 application is directed to a method for routing message data from a source node to a destination node in a mobile ad hoc network that includes a plurality of intermediate mobile nodes between the source node and the destination nodes. In particular, the '553 application discloses that the method includes (1) transmitting a route request to discover routing to a destination node from a source node; (2) at each intermediate node, determining whether the intermediate node can support the route request and, if so, forwarding the route request to another intermediate node and the destination node; (3) at the destination node, upon receiving the route request, generating a reply to the source node for each discovered route; (4) at the source node, ranking the discovered routes to at least one link metric; (5) at the source node, selecting a plurality of routes to the destination node based upon the ranking; (6) at the source node, transmitting route confirmations to intermediate nodes on the plurality of selected routes; and (7) at the source node, distributing the message data to the destination node along the plurality of discovered routes. Thus, as described at paragraph [0028], the '553 application discloses a system in which an intermediate node merely determines whether the node itself is able to relay the message data transmitted from a source node.

Therefore, Applicants respectfully submit that the '553 application fails to remedy the deficiencies of the '196 patent, as discussed above. In particular, the '553 application fails to disclose a radio station, different from a radio control station and a direct radio station capable of transmitting an information signal directly to the radio control station, that receives a relay control signal to which a reception level of the control signal at another radio station is added, as recited in Claim 30. Further, the '553 application fails to disclose that when the reception level added to the relay control level is smaller than the reception level at the radio control station, the relay controlling unit adds the reception level at the radio station

to the received relay control signal, and relays the relay control signal, to which the reception level at the radio station is added, to other neighboring radio stations, as recited in Claim 30.

Further, the '553 application fails to disclose that in response to receiving a relay control signal, the direct radio station transmits a response relay control signal that includes a route to the radio station, which then transmits the information signal according to the route, as required by Claim 30. Rather, the '553 application merely discloses that a source node, which appears to correspond to the radio station recited in Claim 30, determines the route, sends route confirmations to the intermediate nodes, and then distributes the message data to the destination node along the plurality of discovered routes. However, the '553 application does not disclose a direct radio station that determines a route, and sends the route to the radio station, in response to receiving a relay control signal, as recited in Claim 30.

Thus, no matter how the teachings of the '196 patent and the '553 application are combined, the combination does not teach or suggest a radio station that includes a relay controlling unit configured to receive a relay control signal to which a reception level of the control signal at another radio station is added, as recited in Claim 30. Further, the combined teachings of the '196 patent and the '553 application fail to disclose that when the reception level added to the relay control signal is smaller than the reception level at the radio station, the relay controlling unit adds the reception level at the radio station to the received relay control signal, and relays the relay control signal to other neighboring radio stations, as recited in Claim 30. Further, the combined teachings of the '196 patent and the '553 application fail to disclose that when a radio station a source of the information signal, the radio station transmits the information signal according to a route notified by a response relay control signal that is transmitted by a direct radio station, in response to receiving a relay control signal at the direct radio station, as recited in Claim 30. Accordingly, for the reasons stated above, Applicants respectfully submit that a *prima facie* case of obviousness has not

been established and that the rejection of Claim 30 (and all associated dependent claims) should be withdrawn.

Independent Claims 29 and 31 are directed to a multi-hop communication system, and a multi-hop communication method, respectively, and recite limitations analogous to those recited in Claim 30. Accordingly, for the reasons stated above, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and that the rejections of Claims 29 and 31 should be withdrawn.

Regarding the rejection of dependent Claim 12 under 35 U.S.C. § 103(a), Applicants respectfully submit that the '290 patent fails to remedy the deficiencies of the '196 patent and the '553 application, as discussed above. Accordingly, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and that the rejection of Claim 12 should be withdrawn.

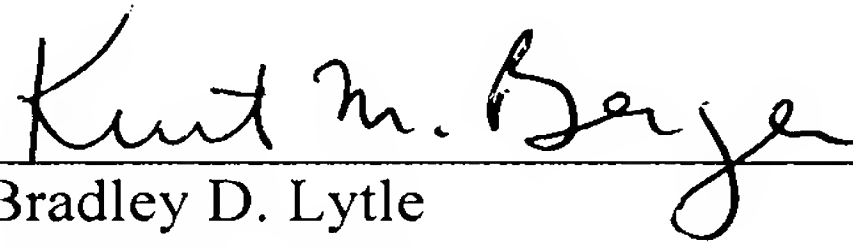
Thus, it is respectfully submitted that independent Claims 29-31 (and all associated dependent claims) patentably define over any proper combination of the '196 patent, the '553 application, and the '290 patent.



Consequently, in view of the present amendment and in light of the above discussion, the outstanding grounds for rejection are believed to be have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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